

This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

**As rescanning documents *will not* correct images,
please do not report the images to the
Image Problem Mailbox.**

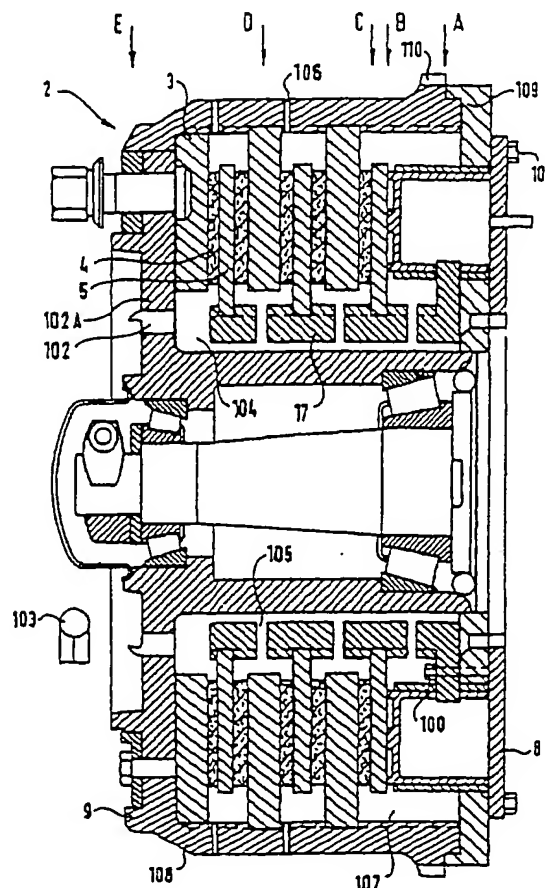
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : F16D 55/42, 65/847	A1	(11) International Publication Number: WO 97/20150 (43) International Publication Date: 5 June 1997 (05.06.97)
<p>(21) International Application Number: PCT/SE96/01570</p> <p>(22) International Filing Date: 29 November 1996 (29.11.96)</p> <p>(30) Priority Data: 9504286-7 29 November 1995 (29.11.95) SE</p> <p>(71) Applicant (for all designated States except US): K.S. TECHNOLOGY HB [SE/SE]; Gånggriftsvägen 4, S-471 94 Källekärr (SE).</p> <p>(72) Inventors; and (75) Inventors/Applicants (for US only): KARLSSON, Gerth [SE/SE]; Gånggriftsvägen 4, S-471 94 Källekärr (SE). SUNDQVIST, Bengt [SE/SE]; Ekbacken 5, S-440 92 Svanesund (SE).</p> <p>(74) Agent: CEGUMARK AB; P.O. Box 53047, S-400 14 Göteborg (SE).</p>	<p>(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DE (Utility model), DK, DK (Utility model), EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> <i>In English translation (filed in Swedish).</i></p>	

(54) Title: **BRAKE DEVICE**

(57) Abstract

The present invention relates to a brake device comprising a number of brake discs, brake pads and brake pad holders being arranged for mutual co-operation after axial operation by means of actuators for braking. The brake pads are being carried by the brake pad holders (5) that are connected to a first frame member. Ring shaped brake discs are carried by a second frame member. Brake pad holders and brake discs are axially displaceable journaled relative to each other. The two frame members are arranged to be braked relative to each other after actuation of axially acting actuators. In order to provide efficient cooling of the parts that comprises the brake, there are a number of passages (102) provided in the brake drum (102A) for leading air internally (104) to the brake system when the drum and the wheel rotates in the direction of travel.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

Title:

Brake device

5

The present invention relates to a brake device comprising a number of brake discs, brake pads and brake pad holders being arranged for mutual co-operation after axial operation by means of actuators for braking, the brake pads being carried by the
10 brake pad holders that are connected to a first frame member, ring shaped brake discs are carried by a second frame member, brake pad holders and brake discs being axially displaceable journaled relative to each other, wherein the two frame members are arranged to be braked relative to each other after actuation
15 of axially acting actuators.

Brakes for vehicles are usually categorised into drum brakes and disc brakes. Disc brakes are the most common brakes on passenger vehicles, due to their efficiency and flexibility, while drum
20 brakes are more usually used on trucks and busses, thanks to their ability for large scaling, i.e. that the brakes may be designed with large dimensions, e.g. for the purpose of cooling and for good braking.

25 The primary object of the present invention, is to provide a brake device according to the introductory part of claim 1, where the braking performance and the cooling performance are unchanged in spite of the small dimensions and the safe function of the brake.

30

Said objects are achieved with a device in accordance with the present invention which is principally characterized in that there are a number of passages/openings provided in the frame member/brake housing of the brake for leading air internally to the brake and thereby providing air cooling of comprised brake parts.

The invention will in the following be further described as a number of preferred embodiments with reference to the accompanying drawings, in which:

- Fig. 1 is a cross sectional view of a brake in an active breaking condition,
- Fig. 2 shows in a plane view the brake device with different parts in section,
- Fig. 3 shows another embodiment of a brake with cooling, shown in cross section,
- Fig. 4 shows in a plane view said brake in section along different section lines in Fig. 3, and
- Fig. 5 shows different views of ventilation openings for a brake housing.

A device 1 for a brake 2 which is primarily intended for use with vehicles like busses, trucks, lorries etc., but may also be used for other purposes, and comprising a number of brake discs 3, brake pads 4, and brake pad holders 5 that are adapted to cooperate with each other after axial 6 actuation of the brake 2 by means of actuator means 7 for braking, with said comprised parts being arranged in a special way.

To be precise, the brake pads 4 are carried by the brake pad holder 5, which is connected to a first frame member 8.

Moreover, ring shaped brake discs 3 are carried by a second frame member 9. In order to allow for self adjustment of the active brake parts 3; 4, 5, said brake pad holders 5 along with the there upon carried brake pads 4, and brake discs 3 are axially displaceable journalled 10 relative to each other. For this object, the two frame members 8, 9 are adapted to be braked relative to each other after actuation of axially acting actuators 7.

One of said two frame members 8, 9 is formed by a vehicle chassis 8, and the second frame member is formed by a rotatable drum 9 onto which for example a vehicle wheel is arranged to be attached efficiently and secure by means of wheel bolts 11 according to art and not disclosed in detail. The brake discs 3, the number of which may vary from a single up to a large number depending upon space and breaking performance, are preferably connected to the drum 9. They are for this object received by the drum 9 with their respective outer circumference part 12 of the brake discs 3 in a number of axially running grooves 13.

Preferably, there are several grooves 13 in the form of splines distributed correspondingly along the external mantle surface 16 of the brake discs.

Moreover, there are disc shaped brake pad holders 5 mounted on a hub shaped centre part 17 upon the respective frame member 8 non-rotatable connected relative to said centre part 17. Said brake pad holders 5 are ring shaped and are axially displaceable journalled with internal splines 18 received in external splines 19 on the centre part 17, in the axial direction 10.

Said hub shaped centre part 17 is formed by a cylinder, the end part 20 of which is rigidly connected by means of a flange 21 to an inner, non-rotatable connected rotatable frame disc into the centre opening 23 of which a bearing 4 for the frame members 8, 9 reaches and which bearing is used in a central cavity 25.

Preferably, brake pads 4 are shaped as rings or are composed by a number of segments of brake pad material together forming a ring. Preferably, said brake pads 4 are made of an asbestos free material that is carried mounted at each side 26, 27 of the respective brake pad holder 5.

The brake pad holder 3 being located nearest the actuator means 7 lacks brake pad material along the flat side 27 which is turned towards it by reasons that will be easily understood.

Said actuator means 7 comprise at least one jack which is adapted to operate by means of a suitable fluid, preferably pneumatic. For example, there may be arranged a plurality of equally around the circumference of the brake 2 distributed jacks.

In the disclosed embodiment, the jack is formed by a single ring shaped piston 7, one end 28 of which is acting against a frame member 8, and which is acting with the other end 29 against the formed aggregate 30 of brake pads 4, brake pad holder 5 and brake discs 3 in order to provide compression in the force direction 6 against an opposed frame member 9, namely the internal gable wall 31 of the drum.

A correspondingly designed brake 2 is arranged to function efficiently. As an example may be mentioned that the operative braking surface for the brake pads 4 is doubled in comparison with conventional drum brakes of a corresponding size, which
5 ought to explain the efficiency of the present brake which is about three times better.

The assembly of the parts that comprise the brake 2 is also simple to execute.

10

In the brake 2 which is shown in Fig. 3-4 there are three ring shaped brake discs 3 which are ventilated and which also may move axially, carried by the enveloping brake drum 9. There are three disc shaped brake pad holders 5, with brake pads 4 for
15 example attached by gluing along at least one of the flat sides. Said brake pad holders 5 are also axially displaceable journalled independent from each other on a tube shaped centre part 17 which is attached by means of screws 100 in the frame member which functions as a brake shield 8.

20

The disclosed embodiment comprises a plurality of pistons 7 that are equally distributed around the circumference and are attached to the brake shield 8 by means of screws 101. The function of these actuator means 7 is also to compress the brake
25 discs 3 and the pads 4 when for example the pneumatic pressure increases for providing braking. Since the brake 2 is self adjusting, breaking will be provided instantly without any substantial delay.

30

In order to provide an efficient cooling of the parts that comprises the brake there are a plurality of passages 102 in the

front side 102A of the brake drum and there is attached a pre-shaped bent metal sheet or piece of plastic 3. This piece 103 is turned or manufactured in some other way with the desired angle depending upon which side of the vehicle that the brake 2 is mounted for pressing air into the inside 104 of the brake system when the brake drum and the wheel is rotating in the direction of travel. In said centre part 17, which retains the brake pad holders 5 and the brake pads 4, there are arranged preferably radial through channels or holes 105 enabling for entering air to pass through the ventilated brake discs 3, for example via radial channels 107 and flow upward and out to the environment via further holes 106 which are arranged in the surrounding mantle shaped outer shell 108 of the drum.

Dirt and other undesirable matter is pressed out from the brake 2 by the action of the centrifugal force.

A ring 110 may be pressed onto the rear edge 109 of the brake drum 2 which ring is provided with irregularities 111 for creating a vacuum between the brake drum 9 and the wheel rim, thereby providing a more efficient air cooling.

For example, two of said pistons 7 may be arranged to be actuated by a so called maxibrake, for providing a prior art hand brake.

The embodiment shown in Fig. 5 clearly illustrates an example of how a plurality of ventilation openings 206 are arranged distributed along the brake housing 250 in which the movable parts of the brake are housed protected. Preferably, said ventilation openings 206 are manufactured by punching from the

inside 251 of the brake housing. By this, a baffle wall 252 or an edge is formed at the opening 206 which is directed with its opening turned toward the direction of rotation 253 of the brake housing 250. When driving the vehicle and the wheels, the brake housing 250 of each wheel is rotating and air L is pressed in through the formed opening 206 by means of said baffle wall or scoop shaped means 252 for controlling air flow, wherein an efficient flow of air to the insides 251 of the brake is achieved.

10

The invention is not limited to the above described and in the drawings shown embodiments of the brake device but may be varied within the scope of the claims without leaving the scope of the invention.

15

CLAIMS

1. Brake (2) device (1) comprising a number of brake discs
5 (3), brake pads (4) and brake pad holders (5) being arranged for
mutual co-operation after axial (6) operation by means of
actuators (7) for braking, the brake pads (4) are carried by the
brake pad holders (5) that are connected to a first frame member
(8), ring shaped brake discs (3) are carried by a second frame
10 member (9), brake pad holders (5) and brake discs (3) being
axially displaceable (10) journalled relative to each other,
wherein the two frame members (8, 9) are arranged to be braked
relative to each other after actuation of axially acting
actuators (7), c h a r a c t e r i z e d in that there are a
15 number of passages (102)/openings (206) provided in the frame
member (8)/brake housing (250) of the brake for leading air
internally to the brake and thereby providing air cooling of
comprised brake parts.

20 2. Brake device according to claim 1, wherein one of said frame
members (8, 9) is formed by a vehicle chassis (8) and the other
frame member is formed by a rotatable brake drum (9),
c h a r a c t e r i z e d in that the brake discs (3) are
connected to the drum (9) received with their respective outer
25 circumference part (12) in axially running grooves (13).

3. Brake device according to claim 2,
c h a r a c t e r i z e d in that several grooves (13
respectively 15) formed as splines are distributed along the
30 internal envelope surface (14) of the drum (9) respectively the
external mantle surface (16) of the brake discs (3).

4. Brake device according to any one of claims 1-3,
c h a r a c t e r i z e d in that the disc shaped brake pad
holders (5) are mounted on a hub shaped centre part (17) upon
the respective frame member (6) non-rotatable connected relative
5 to said centre part (17).
5. Brake device according to claim 4,
c h a r a c t e r i z e d in that the brake pad holders (5) are
ring shaped and are axially displaceable journalled with
10 internal splines (18) received in external splines (19) on the
centre part (17).
6. Brake device according to any of claims 4-5,
c h a r a c t e r i z e d in that the hub shaped centre part
15 (17) is formed by a cylinder, the end part (20) of which is
connected by means of a flange (21) to an inner, relative to the
drum, rotatable frame disc (22).
7. Brake device according to any of the above claims,
20 c h a r a c t e r i z e d in that the brake pads (4) are shaped
as rings or are composed by segments together forming a ring.
8. Brake device according to claim 7,
c h a r a c t e r i z e d in that the brake pads (4) are being
25 carried mounted at each side (26, 27) of the respective brake
pad holder (5).
9. Brake device according to any one of claims 1-8,
c h a r a c t e r i z e d in that the actuators comprise at
30 least one fluid operated jack (7).

10. Brake device according to claim 9,

c h a r a c t e r i z e d in that the jack comprises a ring shaped piston, one end (28) of which is acting against a frame member (8), and which is acting with the other end (29) against the formed aggregate (30) of brake pads (4), brake pad holders (5) and brake discs (3) for compression against a frame member (9).

11. Brake device according to any one of the above claims,

c h a r a c t e r i z e d in that at said passages (102)/openings (206) are arranged means (103; 252) adapted for pressing air in through the related passages (102; 206).

12. Brake device according to claim 11,

c h a r a c t e r i z e d in that a pre-shaped bent metal sheet or piece of plastic (103), which is turned or manufactured in some other way with the desired angle depending upon which side of the vehicle that the brake (2) is mounted, for pressing air into the inside (104) of the brake system when the brake drum and the wheel is rotating in the direction of travel, are present at the respective passage (102) at the front (102A) of the brake drum.

13. Brake device according to claim 11,

c h a r a c t e r i z e d in that a number of ventilation openings (206) are arranged distributed along the brake housing (250) in which the movable parts of the brake are housed.

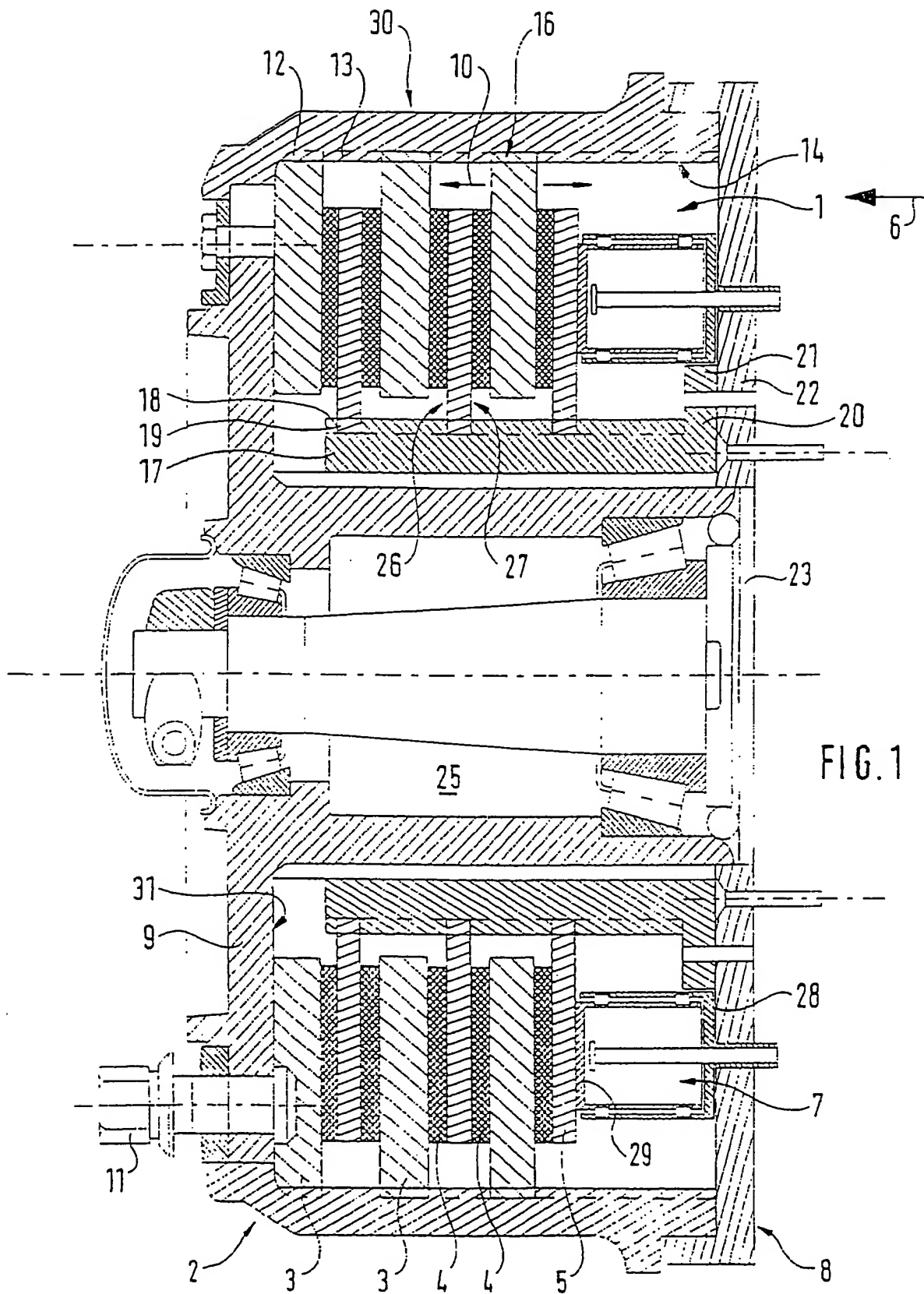
14. Brake device according to claim 13,

c h a r a c t e r i z e d in that said ventilation openings (206) are manufactured by punching from the inside (251) of the

brake housing whereby a baffle wall (252) or an edge is formed at the respective opening (206) for directing air (L) through said opening.

- 5 15. Brake device according to any one of claims 1-14,
c h a r a c t e r i z e d in that a ring (110) is pressed onto
the rear edge (109) of the brake drum (2) which ring is provided
with irregularities (111) for creating a vacuum between the
brake drum (9) and wheel rim, thereby creating a more efficient
10 air cooling.

1/5



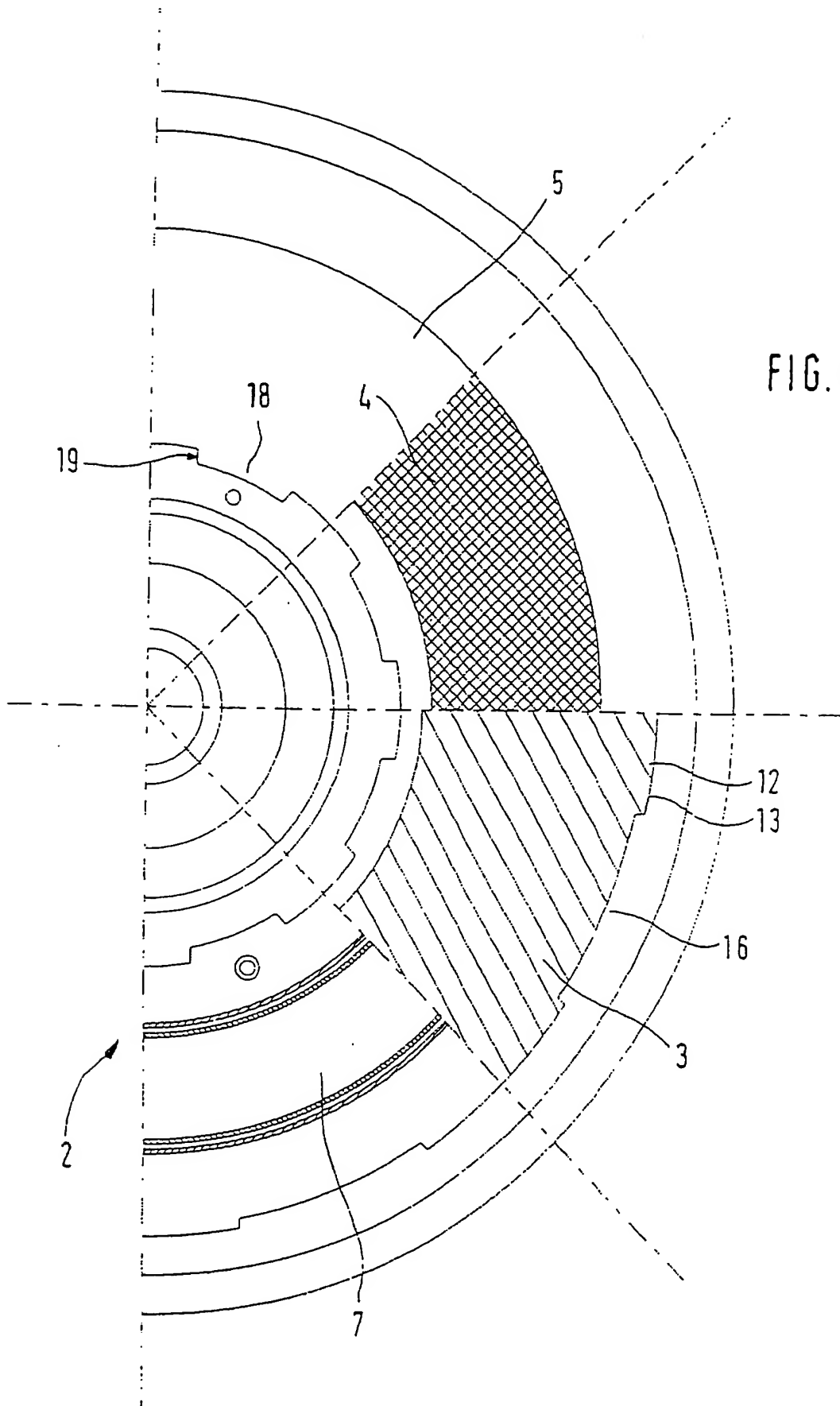
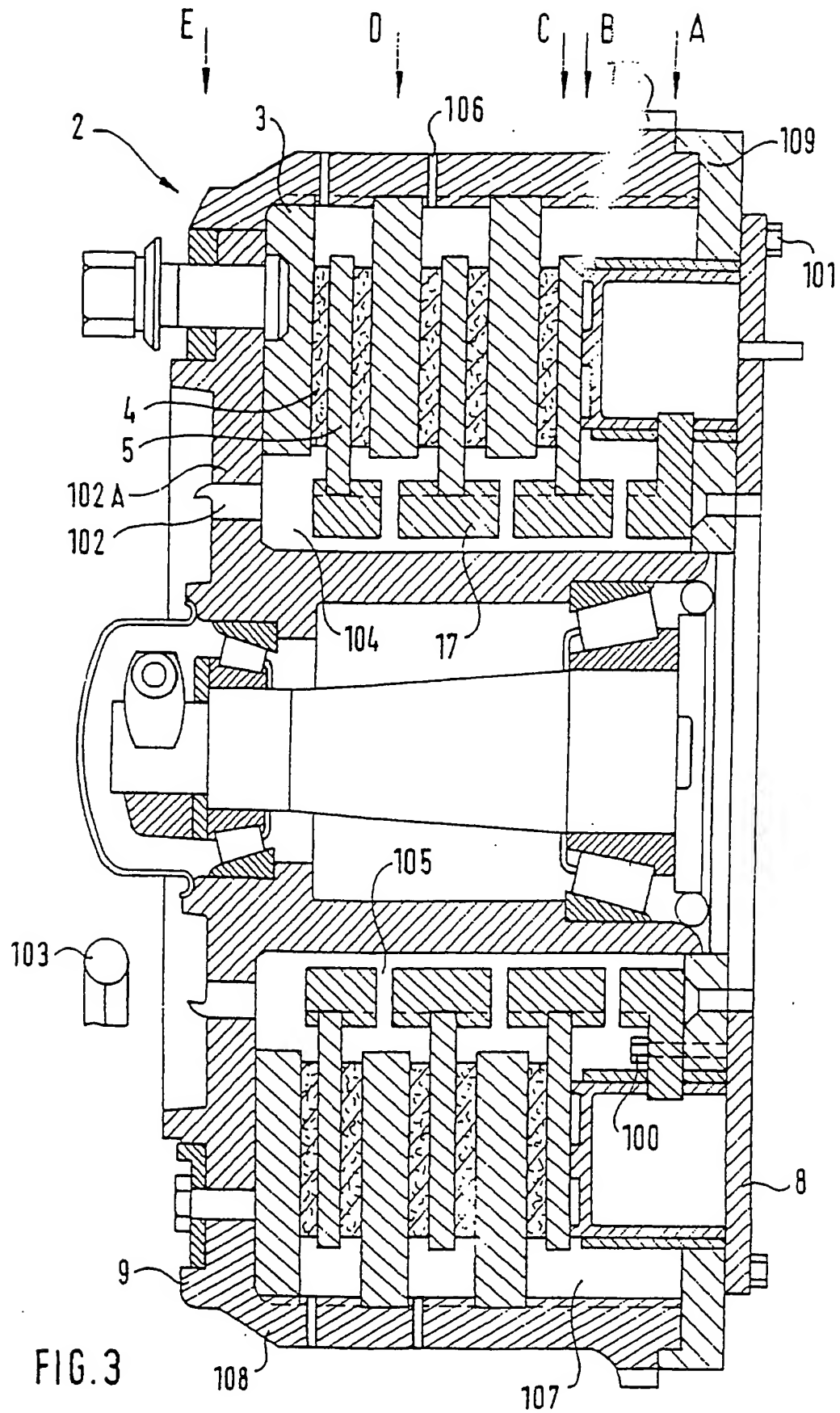


FIG. 2

3/5



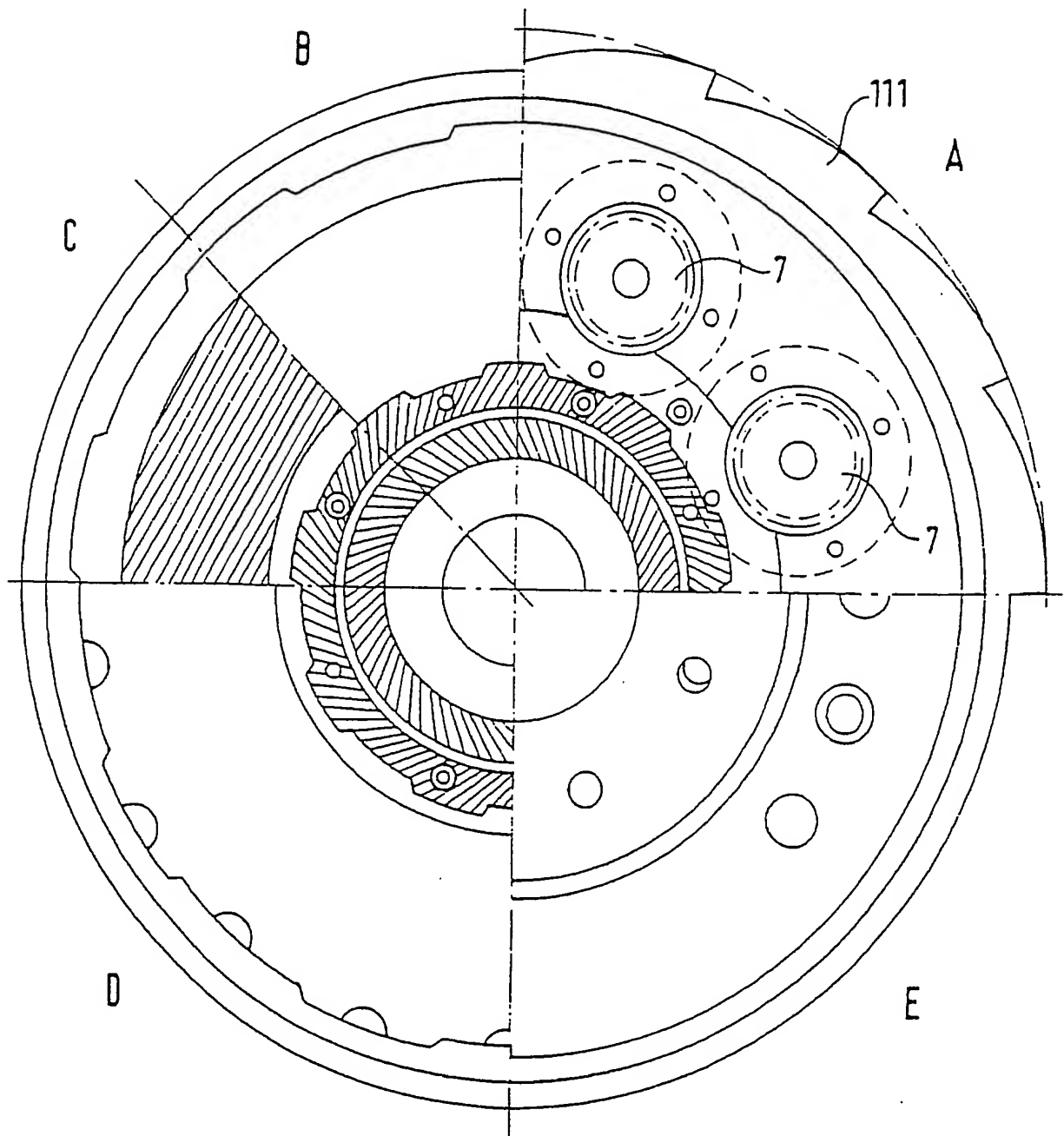
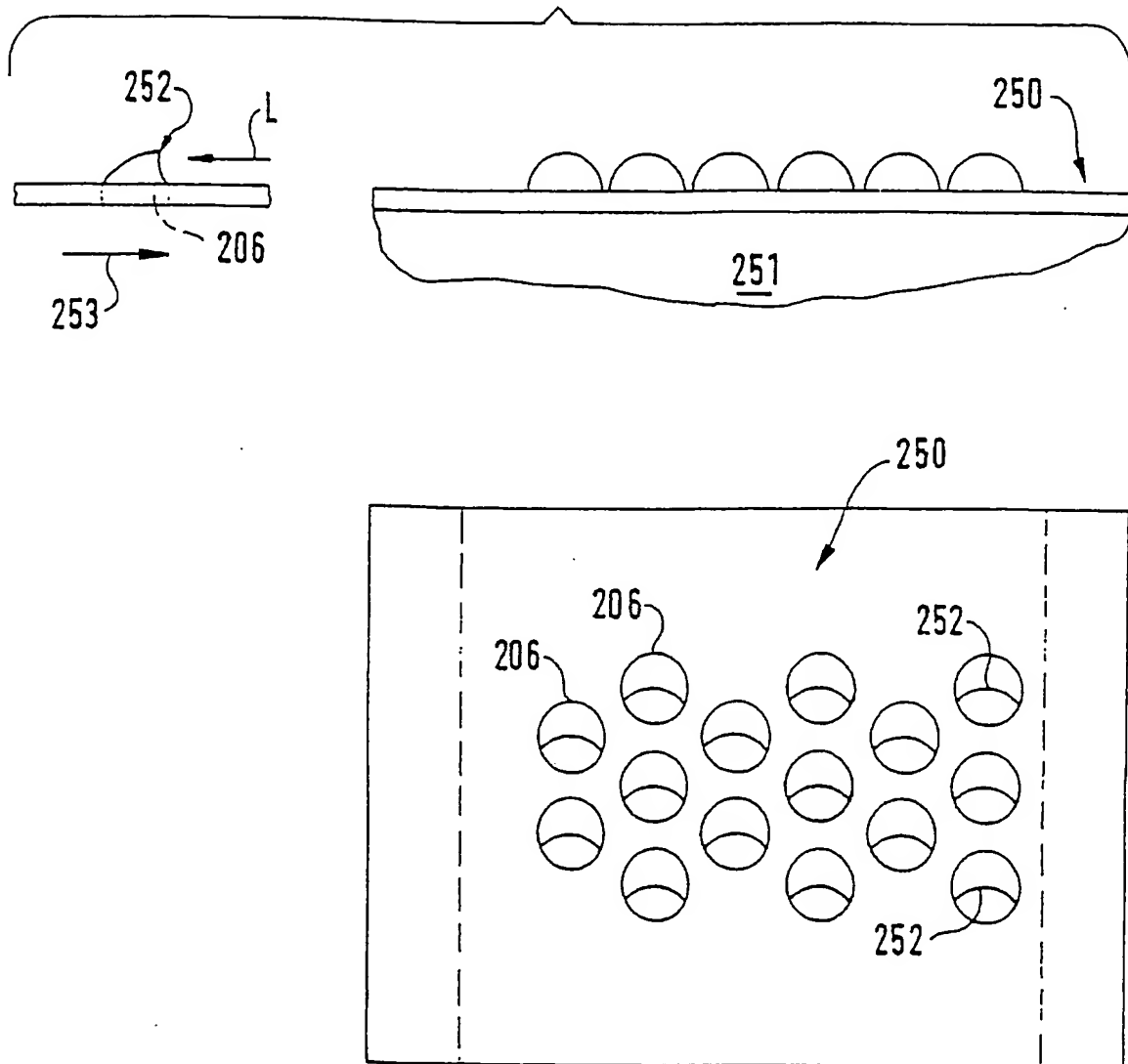


FIG. 4

5/5

FIG. 5



INTERNATIONAL SEARCH REPORT

Inter. enal application No.

PCT/SE 96/01570

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: F16D 55/42, F16D 65/847

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: F16D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3862678 A (COLLINS), 28 January 1975 (28.01.75), column 3, line 8 - column 4, line 47, figure 2, abstract --	1-15
Y	SE 379235 B (T C MARTIN), 29 Sept 1975 (29.09.75), page 6, line 40 - page 7, line 5, figure 3 --	1-15
A	DE 3106374 C2 (HONDA GIKEN KOGYO K.K.), 25 April 1985 (25.04.85), figure 2 --	1-15
A	SE 450155 B (ROCKWELL INTERNATIONAL CORPORATION), 9 June 1987 (09.06.87), figure 2 --	1-15

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

4 March 1997

Date of mailing of the international search report

03 -04- 1997

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer

Tycho Beckman
Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 96/01570

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 1209370 B (LAMBERT BRAKE CORPORATION), 20 January 1966 (20.01.66), figure 2 -- -----	1,11-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

03/02/97

International application No.
PCT/SE 96/01570

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 3862678	28/01/75	CA-A- 1024458	17/01/78
		CA-A- 1030882	09/05/78
		DE-A- 2436098	13/02/75
		FR-A,B- 2239619	28/02/75
		GB-A- 1475159	01/06/77
		JP-C- 1110818	31/08/82
		JP-A- 50070777	12/06/75
		JP-B- 57002938	19/01/82
SE-B- 379235	29/09/75	CA-A- 929558	03/07/73
		DE-A- 2039774	25/02/71
		GB-A- 1293210	18/10/72
		US-A- 3899049	12/08/75
		US-A- 3931871	13/01/76
		US-A- 3998295	21/12/76
DE-C2- 3106374	25/04/85	GB-A,B- 2072280	30/09/81
		JP-C- 1419663	14/01/88
		JP-A- 56118472	17/09/81
		JP-B- 62028831	23/06/87
		US-A- 4456099	26/06/84
		CA-A- 1163906	20/03/84
		DE-A,C- 3106290	14/01/82
		FR-A,B- 2479491	02/10/81
		GB-A,B- 2072371	30/09/81
		JP-C- 1303886	28/02/86
		JP-A- 56119113	18/09/81
		JP-B- 60027965	02/07/85
SE-B- 450155	09/06/87	CA-A- 1168598	05/06/84
		DE-A,C- 3143607	12/08/82
		FR-A,B- 2493940	14/05/82
		GB-A,B- 2087014	19/05/82
		JP-C- 1586080	31/10/90
		JP-B- 2012289	19/03/90
		JP-A- 57110835	09/07/82
		NL-A- 8104799	01/06/82
		SE-A- 8106624	11/05/82
		US-A- 4358000	09/11/82
DE-B- 1209370	20/01/66	NONE	